

REMARKS

Applicants thank Mr. Hoang M. Nguyen for the courtesies he extended to applicants' representative during the Telephonic Interview conducted on March 19, 2010, and for the assistance in furthering prosecution on the merits of the instant application. During the Telephonic Interview, the rejection of independent claims 21, 35, and 39 in view of the cited art was discussed. No agreement with respect to patentability of the claims was reached. The following remarks take into account the content of the Telephonic Interviews.

Claims 21-40 are pending in this application, with claims 21, 35, and 39 being the only independent claims. No amendments to the claims have been made. Reconsideration of the above-identified application is respectfully requested.

Claims 21-27 and 35-40 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Pub. No. 2003/0172654 ("*Lawheed*") in view of U.S. Patent 4,429,661 ("*McClure*"). Claims 28-34 stand rejected under 35 U.S.C. §103(a) as obvious over *Lawheed* in view of *McClure* and WO 85/02881 ("*Lipovetz*"). For the following reasons, reconsideration of these rejections is requested.

Independent claim 21 recites "expanding the evaporated working fluid in a low-pressure expansion device, wherein the low-pressure expansion device is a roots blower having triple blade rotors arranged and dimensioned so that the working fluid is expanded therein and heat energy is transformed to mechanical energy."

The combination of *Lawheed* and *McClure* fails to disclose the above limitation because the compressor-type roots blower disclosed in *McClure* fails to disclose an expansion device that is a roots blower.

The Examiner (at pg. 2 of the Office Action) has acknowledged that *Lawheed* fails to teach or suggest a triple lobes rotor, and cites *McClure* for this feature. Applicants, however,

respectfully disagree that the combination of *Lawheed* and *McClure* achieves a low-pressure expansion device that is a roots blower having triple blade rotors arranged and dimensioned so that the working fluid is expanded therein and heat energy is transformed to mechanical energy, as recited in independent claim 21 and correspondingly recited in independent claims 35 and 39.

McClure teaches a flue gas recovery apparatus for reconstituting thermal energy. According to *McClure*, the flue gas heat recovery apparatus includes a compressor 60 which draws relatively low temperature exhaust gases from within the exhaust flue of a heating plant at a relatively low inlet pressure and discharges the gases at an elevated outlet pressure to a heat exchanger disposed within the heating plant cold fluid return duct which receives the discharged gases to effect the transfer of thermal energy therefrom to fluid flowing within the return duct (see col. 3, lines 42-50; col. 7, lines 38-44; and Fig. 1 of *McClure*). *McClure* thus teaches a system including a compressor that transfers hot gas from an exhaust flue through a first heat exchanger located in cold gas, where the compressor increases the pressure and temperature of the flue gas passing therethrough and discharges the flue gas through a second heat exchanger.

However, even though *McClure* discloses that the compressor may be a roots blower type pump having triple blade rotors, *McClure* fails to teach or suggest an expansion device that is a roots blower. The compressor of *McClure* operates exactly opposite to how an expansion device operates. That is, a compressor compresses a fluid or gas but there is no expansion of the fluid or gas that is performed by the compressor. The compressor of *McClure* requires a prime mover or motor to compress the flue gas (see, e.g., col. 6, lines 41-44 of *McClure*). Moreover, the direction of rotation of the lobes of a compressor differs and is opposite to the direction of rotation of the lobes of an expansion device. Consequently, the contour of the lobes of the *McClure* compressor device must be designed significantly different than an expansion device to provide airtight contact between the lobes without incurring the risk of blocking the lobes due to

their different direction of rotation. One skilled in the art knows that if the roots blower compressor of *McClure* were operated in the wrong direction, it is highly likely that the lobes would interlock with each other due to the small tolerances between the lobes for ensuring the airtight contact between the lobes. Moreover, vents located at the inlet and the outlet of a compressor are adjusted entirely differently than the vents at the inlet and the outlet of an expansion device. Accordingly, *McClure* teaches a device that is entirely different than applicants claimed roots blower type expansion device.

Lawheed discloses a system and method for converting solar energy to electrical and thermal energy. *Lawheed* (paragraph [0043]) describes a system and methodology for converting low temperature thermal energy to electrical energy using a Rankine cycle mechanism to thereby drive an electrical generator and produce a desired type of electricity. *Lawheed* (Fig. 6) depicts a Rankine cycle mechanism that includes two lobes 86, 88 (also see Fig. 5), where the lobes 86, 88 are sized so that during opposite rotation the projections, which each comprise surfaces 110 can turn and engage female cavities 112. As shown in Fig. 3 of *Lawheed*, the two lobes 86, 88 are interconnected by a gear at a location indicated by reference designator 102. *Lawheed* thus teaches a Rankine cycle mechanism with only two lobes.

It should be noted that a Rankine cycle is a thermodynamic cycle that converts heat into work, i.e., heat \rightarrow work. Based on the teachings of *Lawheed*, the skilled person is only provided with a reason to consider other cycles or systems in which heat is also converted into work. In fact, absent an impermissible hindsight construction based on applicants' own disclosure, *Lawheed* provides no reason or motivation to consider cycles other than those in which heat is converted into work.

As stated previously, the Examiner identified roots blower of *McClure* is a compressor that operates to compress a flue gas. This compression of the flue gasses is achieved by

consuming mechanical energy, i.e., the compressor is driven by a prime mover or electric motor. The pressure and the temperature, and therefore the thermal energy of the flue gasses are increased by the compression to convert work input by the prime mover into heat, i.e., work \rightarrow heat. There is no teaching or suggestion that the compressor of *McClure* could operate to convert heat into work. Accordingly, the skilled person is provided with no reason or motivation to consider the *McClure* system in an attempt to improve the Rankine cycle mechanism of *Lawheed*.

Given that *Lawheed* converts heat into work and *McClure* performs an opposite function to convert work into heat, the person of ordinary skill in the art would not seek to modify a device for converting heat into mechanical work based on the features of a device for converting mechanical work into heat. There is simply not even the slight hint, teaching or suggestion whatsoever provided by *McClure* to modify the expansion device of *Lawheed* to incorporate the compressor of *McClure*. The skilled person would not seek to combine the teachings of different system in the Examiner's proffered manner. *McClure* simply fails to teach or suggest the use of a triple blade roots blower to improve flow rates. *McClure* moreover makes no mention whatsoever of why the skilled person would use a triple blade roots blower in an expansion device. Only applicants' specification teaches the use of a roots blower to expand an evaporated working fluid and transform heat energy into work energy.

When combining prior art elements, the rationale to support a conclusion that the claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination yielded nothing more than predictable results to one of ordinary skill in the art. *KSR*, 550 U.S. at ___, 82 USPQ2d at 1395; *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 USPQ 449, 453 (1976); *Anderson's-Black Rock, Inc. v.*

Pavement Salvage Co., 396 U.S. 57, 62-63, 163 USPQ 673, 675 (1969); *Great Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152, 87 USPQ 303, 306 (1950).

In this case, the proposed modification of the Rankine cycle mechanism of *Lawheed* to incorporate the compressor of *McClure* changes their respective functions because *McClure* discloses a compressor that operates exactly opposite to the Rankine cycle mechanism of *Lawheed*.

Particularly, *McClure* relates to an apparatus and methods for recovering waste heat in exothermic processes, and particularly describes apparatus and methods for recovering heat from exhaust gases normally vented through an exhaust flue from a heating plant (see col. 1, line 5-10). The Rankine cycle of *Lawheed*, however, is a closed loop cycle, and neither liquids nor gasses are vented or exhausted from this closed loop cycle. Accordingly, the skilled person would need to open the closed loop Rankine cycle of *Lawheed* to provide a waste stream whose energy can be recovered to thereby apply the teachings of *McClure*. Since the Examiner-proposed combination requires that both the *Lawheed* apparatus and the *McClure* compressor both change their function, the proposed combination can not be considered to teach or suggest “expanding the evaporated working fluid in a low-pressure expansion device, wherein the low-pressure expansion device is a roots blower having triple blade rotors arranged and dimensioned so that the working fluid is expanded therein and heat energy is transformed to mechanical energy”, as expressly recited in independent claim 21.

Independent claims 21 is therefore not rendered obvious and unpatentable by the combination of *Lawheed* and *McClure*.

Independent claims 35 and 39 include similar limitations and should be allowable for at least the same reasons as is independent claim 21.

The Examiner has acknowledged that the combination of *Lawheed* and *McClure* fails to teach or suggest an “absorbent step”, as recited in dependent claims 28, 35, and 36, and cites *Lipovetz* for this feature.

Applicants, however, respectfully disagree that the combination of *Lawheed*, *McClure* and *Lipovetz* achieves a low-pressure expansion device that is a roots blower having triple blade rotors arranged and dimensioned so that the working fluid is expanded therein and heat energy is transformed to mechanical energy, as recited in now-amended independent claim 21. *Lipovetz* discloses a system for converting heat energy of the environment connected to a heat energy source. The disclosure of *Lipovetz* includes two drawings, i.e., Fig. 1 and Fig. 2. There is nothing whatsoever in Fig. 1 and Fig. 2 of *Lipovetz* regarding a roots blower having triple blade rotors, as recited in now amended independent claims 21, 35 and 39. The combination of *Lawheed*, *McClure* and *Lipovetz* thus fails to teach or suggest applicants’ claimed low-pressure expansion device that is a roots blower having triple blade rotors, because *Lawheed*, *McClure* and *Lipovetz* make no mention whatsoever of a roots blower having triple blade rotors. Applicants accordingly assert that dependent claims 28, 31 and 32 are therefore patentable based on their dependency from independent claims 21, 25 and 39.

Reconsideration and withdrawal of all the rejections under 35 U.S.C. §103(a) are therefore in order, and a notice to that effect is respectfully requested.

In view of the patentability of independent claims 21, 35 and 39, dependent claims 22-34, 36-38 and 40 are also patentable over the prior art for the reasons set forth above, as well as for the additional recitations contained therein.

Based on the foregoing remarks, this application is in condition for allowance. Early passage of this case to issue is respectfully requested.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

Respectfully submitted,
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